



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/717,839	11/20/2003	Suresh K. Chengalva	DP-310030	8565
7590 09/22/2005			EXAMINER	
STEFAN V. CHMIELEWSKI*			SEMENENKO, YURIY	
DELPHI TECHNOLOGIES, INC.				
Legal Staff MC CT10C			ART UNIT	
P.O. Box 9005			2841	
Kokomo, IN 46904-9005			PAPER NUMBER	
			DATE MAILED: 09/22/2005	

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/717,839

Applicant(s)

CHENGALVA ET AL.

Examiner

Yuriy Semenenko

Art Unit

2841

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2003, filing date.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/202003page1.</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1.1. Claims 1-5, 7-10, 12, 15, 16, 18-20 are rejected under 35U.S.C. 103(a) as being obvious over by Sylvester (Patent # 6014317) hereinafter Sylvester.

1.1.1. Regarding claim 1: Sylvester discloses in Fig. 18 a circuit board assembly comprising a laminate substrate 126 (column 9, lines 44-46) having oppositely-disposed first and second surfaces, a surface-mount device 124 attached with at least one solder joint 128 to the first surface of the laminate substrate, and a localized stiffener 132 (and column 19, line 44) attached

Art Unit: 2841

to the second surface of the laminate substrate directly opposite the device, the device and the localized stiffener having lateral dimensions in a plane parallel to the first and second surfaces of the laminate substrate, the laminate substrate, the device, and the localized stiffener having coefficients of thermal expansion and having moduli of elasticity, the coefficients of thermal expansion of the device and the localized stiffener being less than the coefficient of thermal expansion of the laminate substrate, the modulus of elasticity of the localized stiffener being greater than the modulus of elasticity of the laminate substrate (column 19, lines 29-31 and column 20, Table), the localized stiffener being attached to the laminate substrate so as to locally stiffen the laminate substrate beneath the device and thereby increase the fatigue life of the at least one solder joint. Sylvester disclosed in Fig. 18 that at least one of the lateral dimensions of the localized stiffener being equal to the lateral dimensions of the device. Although, Sylvester doesn't explicitly teach that at least one of the lateral dimensions of the localized stiffener being greater than the lateral dimensions of the device at time the invention was made, it was old and well-known to use at least one of the lateral dimensions of the localized stiffener being greater than the lateral dimensions of the device, because Appelt et al. (Patent # 5900675 hereinafter "Appelt") discloses this, as shown in Fig. 3B. And further, it has been held *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) that change in shape and change in size of the configuration of the claimed device was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.

Therefore it would have been obvious to one of ordinary skill in the art, at time the invention was made for Sylvester to include in his invention the dielectric material is attached to the printed circuit board via adhesive dots attached to the printed circuit board motivated by its known suitability for its intended use. See MPEP §2144.07.

1.1.2. Regarding claim 18: Sylvester discloses in Fig. 18 a circuit board assembly comprising a laminate substrate 126 (column 9, lines 44-46) having oppositely-disposed first and second surfaces, a surface-mount integrated circuit device (18, Fig. 1 and column 9, lines 13-15) attached with multiple solder joints 128 to the first surface of the laminate substrate and a non-electrically functional stiffener 132 (and column 19, line 44-46) attached to a limited region of

the second surface of the laminate substrate directly opposite the device (Fig. 18), each of the device and the stiffener having peripheral boundaries that establish a pair of transverse dimensions in a plane (Fig.1) parallel to the first and second surfaces of the laminate substrate, the laminate substrate, the device, and the stiffener having coefficients of thermal expansion and having moduli of elasticity, the coefficients of thermal expansion of the device and the stiffener being less than the coefficient of thermal expansion of the laminate substrate, the modulus of elasticity of the stiffener being greater than the modulus of elasticity of the laminate substrate and at least 18 Gpa (column 19, lines 29-31), the stiffener being attached to the laminate substrate so as to locally increase the biaxial bending stiffness of the laminate substrate between the device and the stiffener and thereby increase the fatigue life of the solder joints. Sylvester disclosed in Fig. 18 that at least one of the one of the transverse dimensions of the localized stiffener is equal to the one of the transverse dimensions of the device. Although, Sylvester doesn't explicitly teach that each of the transverse dimensions of the stiffener being greater than a corresponding one of the transverse dimensions of the device, it was old and well-know to use each of the transverse dimensions of the stiffener being greater than a corresponding one of the transverse dimensions of the device, because Appelt et al. (Patent # 5900675 hereinafter "Appelt") discloses this, as shown in Fig.3B. And further, it has been held In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) that change in shape and change in size of the configuration of the claimed device was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.

Therefore it would have been obvious to one of ordinary skill in the art, at time the invention was made for Sylvester to include in his invention each of the transverse dimensions of the stiffener being greater than a corresponding one of the transverse dimensions of the device motivated by its known suitability for its intended use. See MPEP §2144.07.

1.1.3. Regarding claim 2: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener is attached to the second surface of the laminate substrate with a bonding material (column 19, lines 19-21 and 37-44).

1.1.4. Regarding claims 3 and 19: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1 (18), wherein the localized stiffener is attached to the second surface of the laminate substrate with at least one solder joint (column 10, lines 56-65).

1.1.5. Regarding claim 4: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1 wherein the localized stiffener 132, Fig. 18 is attached to the second surface of the laminate substrate 126 with a plurality of solder joints, the solder joints spacing the localized stiffener from the laminate substrate to define a gap, the circuit board assembly further comprising an underfill material that completely fills the gap between the localized stiffener and the laminate substrate. [Sylvester teaches stiffener can be electrical component such as a capacitor formed on the package (column 19, lines 44-47). In this case, it need plurality of solder joints (at least two for capacitor), which have to be underfill adhesive same as real chip (column 19, lines 37-40)].

1.1.6. Regarding claims 5 and 20: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 4 (19), wherein the localized stiffener is a rejected surface-mount integrated circuit chip that is not electrically functional on the circuit board assembly (column 19, lines 44-56).

1.1.7. Regarding claim 7: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener is larger than the device (Fig. 14 and column 17, lines 50-66).

1.1.8. Regarding claim 8: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 7, wherein each of the lateral dimensions of the localized stiffener 116, Fig. 14, is greater than the lateral dimensions of the device 18:

Art Unit: 2841

1.1.9. Regarding claim 9: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener 116 has a cross-shape in a plane parallel to the first and second surfaces of the laminate substrate.

1.1.10. Regarding claim 10: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 9, wherein the cross-shape of the localized stiffener 116 is defined by two pairs of opposing legs that establish the lateral dimensions of the localized stiffener, each pair of the opposing legs being parallel to one of the lateral dimensions of the device, the lateral dimension established by each pair of the opposing legs being greater than the lateral dimension of the device with which the pair of opposing legs is parallel (see Fig. 14).

1.1.11. Regarding claim 12: And further, Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the device 124, Fig. 18 and the localized stiffener 132 having peripheral boundaries that establish the lateral dimensions of the device and the localized stiffener, the peripheral boundaries of the device being superimposed entirely within the peripheral boundaries of the localized stiffener (see Fig. 18).

1.1.12. Regarding claim 15: And further, Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener has a modulus of elasticity of at least 18 Gpa (see Table column 20, lines 1-20).

1.1.13. Regarding claim 16: And further, Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener is formed of a material chosen from the group consisting of silicon, alumina, silicon nitride, silicon carbide, stainless steel, molybdenum, Fe--Ni alloys, and tungsten (see Table column 20, lines 1-20).

Art Unit: 2841

1.2. Claims 1, 2, 6, 7, 12-17 are rejected under 35U.S.C. 103(a) as being obvious over by Appelt et al. (Patent # 5900675) hereinafter "Appelt".

1.2.1. Regarding claim 1: Appelt discloses in Fig. 2 a circuit board assembly comprising a substrate 200 having oppositely-disposed first and second surfaces, a surface-mount device 230 attached with at least one solder joint 240 to the first surface of the laminate substrate 200, and a localized stiffener 210 attached to the second surface of the substrate directly opposite the device (column 4, lines 15-27), the device and the localized stiffener having lateral dimensions in a plane parallel to the first and second surfaces of the substrate with at least one of the lateral dimensions of the localized stiffener being greater than the lateral dimensions of the device (see Fig.2), the substrate, the device, and the localized stiffener having coefficients of thermal expansion and having module of elasticity, the coefficients of thermal expansion of the device ($2 \text{ ppm}/^{\circ}\text{C}$) and the localized stiffener ($3 \text{ ppm}/^{\circ}\text{C}$) being less than the coefficient of thermal expansion of the laminate substrate ($17 \text{ ppm}/^{\circ}\text{C}$) (column 4, lines 9-23), the modulus of elasticity of the localized stiffener (the modulus of elasticity of the INVAR is 140 GPa (Azom.com)) being greater than the modulus of elasticity of the laminate substrate (the modulus of elasticity of the copper is 120 GPa (Handbook of chemistry and Physics, 82-nd edition, 2001-2002)), the localized stiffener being attached to the substrate so as to locally stiffen the laminate substrate and thereby increase the fatigue life of the at least one solder joint. Appelt disclosed in one of the embodiments substrate is a laminate substrate (column 5, lines 58-62), 610, Fig. 6, carrier 610) and the localized stiffener being attached to the laminate substrate so as to locally stiffen the laminate substrate beneath the device (Fig. 6). Although, Appelt doesn't explicitly teach that substrate is a laminate substrate and the localized stiffener being attached to the laminate substrate so as to locally stiffen the laminate substrate beneath the device at time the invention was made, it was old and well-know to use a laminate substrate and the localized stiffener being attached to the laminate substrate so as to locally stiffen the laminate substrate beneath the device.

Therefore it would have been obvious to one of ordinary skill in the art, at time the invention was made for Appelt to include in his invention the a laminate substrate and the localized stiffener being attached to the laminate substrate so as to locally stiffen the laminate

Art Unit: 2841

substrate beneath the device, motivated by its known suitability for its intended use. See MPEP §2144.07.

1.2.2. Regarding claim 2: Appelt discloses in Fig. 2 a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener is attached to the second surface of the laminate substrate with a bonding material (column 6, lines 51-65).

1.2.3. Regarding claim 6: Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener is entirely encapsulated with an adhesive (see Fig. 2).

1.2.4. Regarding claim 7: Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1 wherein the localized stiffener is larger than the device (see Fig. 2).

1.2.5. Regarding claim 12: And further, Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the device 230, Fig. 2 and the localized stiffener 210 having peripheral boundaries that establish the lateral dimensions of the device and the localized stiffener, the peripheral boundaries of the device being superimposed entirely within the peripheral boundaries of the localized stiffener (column 4, lines 16-25).

1.2.6. Regarding claim 13: And further, Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the at least one solder joint comprises a plurality of solder joints 240, Fig. 2 that attach the device 230 to the laminate substrate 200, the solder joints spacing the device from the laminate substrate to define a gap, the circuit board assembly further comprising an underfill material 260 that completely fills the gap between the device 230 and the laminate substrate 200 (column 4, lines 37-43).

1.2.7. Regarding claim 14: And further, Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the laminate substrate has conductive vias between the first and second surfaces that thermally couple the device to the localized stiffener (column 7, lines 1-4).

1.2.8. Regarding claims 15 and 16: And further, Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the localized stiffener has a modulus of elasticity of at least 18 Gpa (the modulus of elasticity of the INVAR is 140 Gpa (Azom.com)) and wherein the localized stiffener is formed of a material chosen from the group consisting of silicon, alumina, silicon nitride, silicon carbide, stainless steel, molybdenum, Fe--Ni alloys, and tungsten (column 4, lines 15-24). [INVAR is Fe--Ni alloys].

1.2.9. Regarding claim 17: And further, Appelt discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1, wherein the circuit board assembly is an overmold circuit board assembly, Fig. 2 (column 5, lines 47-48).

1.3. Claims 9-11 are rejected under 35U.S.C. 103(a) as being obvious over by Appelt in view of McCutcheon (Patent # 5958556) hereinafter "McCutcheon".

1.3.1. Regarding claim 9: Sylvester discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 1,

except, Sylvester doesn't explicitly teach the localized stiffener has a cross-shape in a plane parallel to the first and second surfaces of the laminate substrate.

McCutcheon teaches in Fig. 28 the localized stiffener has a cross-shape in a plane parallel to the first and second surfaces of the laminate substrate (column 27, lines 14-20). Therefore, at time the invention was made, it was well know to use the localized stiffener has a cross-shape in a plane parallel to the first and second surfaces of the laminate substrate.

Therefore it would have been obvious to one of ordinary skill in the art, at time the invention was made for Sylvester to include in his invention the localized stiffener has a cross-shape in a plane parallel to the first and second surfaces of the laminate substrate.

Benefit of doing so is to make stiffener's structure more rigid.

1.3.2. Regarding claim 10: Sylvester as modified, discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 9, the lateral dimension of the stiffener 210 is being greater than the lateral dimension of the device 230 (Fig. 2),

except, Sylvester doesn't explicitly teach the cross-shape of the localized stiffener is defined by two pairs of opposing legs that establish the lateral dimensions of the localized stiffener,

McCutcheon teaches in Fig. 28 the cross-shape of the localized stiffener is defined by two pairs of opposing legs 201 that establish the lateral dimensions of the localized stiffener. Therefore, at time the invention was made, it was well know to use the cross-shape of the localized stiffener is defined by two pairs of opposing legs that establish the lateral dimensions of the localized stiffener.

Therefore it would have been obvious to one of ordinary skill in the art, at time the invention was made for Sylvester to include in his invention the cross-shape of the localized stiffener is defined by two pairs of opposing legs that establish the lateral dimensions of the localized stiffener to provide more rigid structure of stiffener.

Although, Sylvester also fail to disclose each pair of the opposing legs being parallel to one of the lateral dimensions of the device at time the invention was made, it was old and well-know to use stiffener with each pair of the opposing legs being parallel to one of the lateral dimensions of the device. And further, it has been held In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) that configuration of the claimed disposable plastic nursing container was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.

Therefore it would have been obvious to one of ordinary skill in the art, at time the invention was made for Sylvester to include in his invention each pair of the opposing legs being parallel to one of the lateral dimensions of the device, motivated by its known suitability for its intended use. See MPEP §2144.07.

Art Unit: 2841

1.3.3. Regarding claim 11: And further, Sylvester as modified, discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 9, wherein the cross-shape of the localized stiffener is defined by two pairs of opposing legs that establish the lateral dimensions of the localized stiffener, each pair of the opposing legs being transverse to the lateral dimensions of the device and projecting beyond the lateral dimensions of the device.

2.1. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yuriy Semenenko whose telephone number is (571) 272-6106. The examiner can normally be reached on 8:30am - 5:00pm.

2.2. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (571)- 272-1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

2.3. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

YS

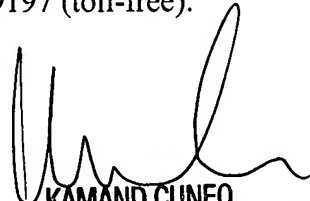
1.3.3. Regarding claim 11: And further, Sylvester as modified, discloses a circuit board assembly, having all of the claimed features as discussed above with respect claim 9, wherein the cross-shape of the localized stiffener is defined by two pairs of opposing legs that establish the lateral dimensions of the localized stiffener, each pair of the opposing legs being transverse to the lateral dimensions of the device and projecting beyond the lateral dimensions of the device.

2.1. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yuriy Semenenko whose telephone number is (571) 272-6106. The examiner can normally be reached on 8:30am - 5:00pm.

2.2. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (571)- 272-1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

2.3. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

YS



KAMAND CUNEO
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800